



TENNESSEE DEPARTMENT OF

**EDUCATION**  
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## Agriscience

<b>Primary Career Cluster:</b>	Agriculture, Food and Natural Resources
<b>Consultant:</b>	Steven Gass, (615) 532-2847, <a href="mailto:Steven.Gass@tn.gov">Steven.Gass@tn.gov</a>
<b>Course Code(s):</b>	5957
<b>Prerequisite(s):</b>	None
<b>Credit:</b>	1
<b>Grade Level:</b>	9
<b>Graduation Requirements:</b>	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses. In addition, this course satisfies one credit of laboratory science required for graduation.
<b>Programs of Study and Sequence:</b>	This is the first course in the <i>Agribusiness, Agricultural Engineering and Applied Technologies, Environmental and Natural Resources, Food Science, Horticulture Science, and Veterinary and Animal Science</i> programs of study.
<b>Aligned Student Organization(s):</b>	FFA: <a href="http://www.tnffa.org">http://www.tnffa.org</a> Allie Ellis, (615) 253-5207, <a href="mailto:Allie.Ellis@tn.gov">Allie.Ellis@tn.gov</a>
<b>Coordinating Work-Based Learning:</b>	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, Teachers are encouraged to use embedded WBL activities. For information, visit <a href="http://tn.gov/education/cte/work_based_learning.shtml">http://tn.gov/education/cte/work_based_learning.shtml</a> .
<b>Available Student Industry Certifications:</b>	None
<b>Dual Credit or Dual Enrollment Opportunities:</b>	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to a local postsecondary institution.
<b>Teacher Endorsement(s):</b>	(048 and 015), (048 and 016), (048 and 017), (048 and 081), (048 and 211), (048 and 212), (048 and 213), (048 and 214), (048 and 414), (048 and 415), (048 and 416), (048 and 417), (048 and 418), (048 and 449), (150 and 015), (150 and 016), (150 and 017), (150 and 081), (150 and 151), (150 and 211), (150 and 212), (150 and 213), (150 and 214), (150 and 414), (150 and 415), (150 and 416), (150 and 417), (150 and 418), (150 and 449), (448 and 015), (448 and 016), (448 and 017), (448 and 081), (448 and 211), (448 and 212), (448 and 213), (448 and 214), (448 and 414), (448 and 415), (448 and 416), (448 and 417), (448 and 418), (448 and 449)
<b>Required Teacher Certifications/Training:</b>	None
<b>Teacher Resources:</b>	<a href="http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml">http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml</a>

### Course Description

*Agriscience* is an introductory laboratory science course that prepares students for biology, subsequent

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science and agriculture courses, and postsecondary study. This course helps students understand the important role that agricultural science and technology plays in the twenty-first century. In addition, it serves as the first course for all programs of study in the Agriculture, Food and Natural Resources cluster. Upon completion of this course, proficient students will be prepared for success in more advanced agriculture and science coursework. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee State Standards in Mathematics, and Tennessee state standards in Anatomy and Physiology, Biology I, Biology II, Chemistry I, Chemistry II, Environmental Science, Physical Science, Physics, and Physical World Concepts, as well as the National Agriculture, Food and Natural Resources Career Cluster Content Standards. This course counts as a lab science credit toward graduation requirements.\*

## **Program of Study Application**

This course is the foundational course for all Agriculture, Food and Natural Resources programs of study. For more information on the benefits and requirements of implementing these programs in full, please visit the Agriculture, Food and Natural Resources website at <http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml>.

## **Course Standards**

### **Agriscience Investigation and Overview**

- 1) Synthesize research on the historical importance and purpose of agriculture and agriculture organizations, identifying major events, opportunities and technological developments influenced by agriscience theories and practices. (TN Writing 8)
- 2) Identify and review general common laboratory safety procedures including but not limited to prevention and control procedures in agriscience laboratories. Incorporate safety procedures and complete safety test with 100 percent accuracy. (TN Reading 3)

### **Agriculture and Society**

- 3) Gather and analyze information from multiple authoritative sources, such as the United States Bureau of Labor Statistics, United States Department of Agriculture website and Tennessee labor data, to summarize the economic impact of the agricultural industry. Describe major career trends in Tennessee, the United States, and worldwide. (TN Writing 8, 9; TN Math S-ID)
- 4) Determine how a Supervised Agricultural Experience (SAE) program functions as a method to apply concepts of the scientific investigation process (i.e. conducting an Agriscience Fair project). Compare and contrast the types of SAEs as related to their importance to the scientific investigation process. (TN Reading 1, 9; TN Writing 2, 7, 9)
- 5) Conduct a research project or literature review exploring a specific social and/or political impact on the agriculture industry at the local, state, national, or international level. For example, explore how the increase in availability of genetically modified organisms has impacted crop production and the green movement. Summarize findings in an informative essay. Revise, edit or rewrite as needed to strengthen writing. (TN Writing 2, 5, 8, 9)

### **Fundamentals of Environmental Systems**

- 6) Describe the biogeochemical cycles impacting the agriculture industry by creating illustrative models and informative texts for the following:
  - a. Carbon cycle
  - b. Nitrogen cycle
  - c. Oxygen cycle
  - d. Water cycle(TN Reading 2; TN Writing 2, 4, 9)
- 7) Critique the dynamics of biomass and energy flow in ecosystems by analyzing the major components of a food chain. Analyze the structure of the relationships among the concepts of carrying capacity, species populations, and organism interactions within multiple ecosystems and natural habitats. (TN Reading 5; TN Writing 1, 9; TN Biology I 2, 3; TN Biology II 2, 3)
- 8) Produce an informative essay to distinguish between types of pollution and their sources, defining and applying ecology- and conservation-specific terminology. Compare and contrast important connections between pollution and its effects on environmental conditions (i.e. water, soil and air), animal populations, and plant populations. (TN Reading 4; TN Writing 2, 4, 8, 9; TN Environmental Science 6)

#### **Fundamentals of Cell Biology**

- 9) Compare basic plant and animal cell biology, including structure and function. Create a visual representation that identifies cellular organelles and major cell processes. (TN Reading 2, 7; TN Biology I 1; TN Biology II 1)
- 10) Compare and contrast the roles of proteins, carbohydrates, lipids, and nucleic acids as they relate to cell growth and cell reproduction. (TN Biology I 1; TN Biology II 1)

#### **Fundamentals of Genetics and Heredity**

- 11) Determine the significance of and relationships between genes, chromosomes, proteins, and hereditary traits. Analyze the role of genes in determining genetic make-up, gender, and hereditary characteristics. Using systems of equations, explain the variation and distribution of genotypes and phenotypes expressed in plants and animals. (TN Math A-CED; TN Biology I 4; TN Biology II 4)

#### **Fundamentals of Anatomy and Physiology**

- 12) Using graphic illustrations and supporting text, identify and describe major animal body systems (skeletal, muscular, respiratory, digestive, nervous, circulatory, respiratory, and reproductive) to establish a basic knowledge of their purpose, structure, and function. (TN A&P 1, 2, 4, 5, 6)

#### **Chemistry of Animal Digestion**

- 13) Classify the types of digestive systems in domestic animals, and compare and contrast their anatomical and physiological differences. Synthesize research on animal nutrition (using academic journals or publications from Tennessee Extension Service) to produce an informative narrative, including defining and applying nutrition specific terminology, to examine the stages of digestion and associated processes. (TN Reading 4, 9; TN Writing 2, 4; TN A&P 5)

- 14) Use the periodic table and the atomic chart to compare differences between ionic and covalent bonding as related to digestion. Demonstrate an understanding of the interdependence of the complex chemical and biological processes involved in the digestion process including, but not limited to, the following: elements, compounds, mixtures, and acids. (TN Reading 1; TN A&P 5; TN Chemistry I 1; TN Chemistry II 1, 2, 3)
- 15) Research the relationship between metabolism, energy, and nutrition. Evaluate life stage and activity level to determine the nutritional needs of animals. Differentiate types of rations to maximize animal performance. (TN Writing 8, 9)

### **Fundamentals of Plant and Soil Science**

- 16) Apply concepts related to the basic cellular and biochemical processes in plants to demonstrate the following:
- Create a graphic illustration of the parts and functions of plant cells
  - Use quantitative reasoning to balance chemical equations related to plant processes
  - Interpret the role of physics within the cohesion-tension theory and its significance to plant life
  - Examine the roles of photopigments and the effects of different colors of light on plant growth
- (TN Reading 7; TN Writing 9; TN Math N-Q, A-REI; TN Biology II 7)
- 17) Formulate a hypothesis about the correlation between plant nutrient deficiencies and soil composition. Conduct basic soil analysis to determine the chemical elements and nutritional levels available in soils essential for plant growth. Draw conclusions about the ability of soils to meet the nutritional requirements of plants. (TN Reading 3, 9; TN Writing 8; TN Biology II 7)

### **Reproductive Systems**

- 18) Research and develop illustrative models that compare and contrast the reproductive structures of plants, drawing out key differences between sexual and asexual reproduction processes. (TN Biology II 7)
- 19) Describe the structure and function of different seed components and summarize their roles in plant reproduction and propagation. (TN Biology II 7)
- 20) Describe the structures and functions of the male and female animal reproductive systems. Compare and contrast the differences of the reproductive systems between small and large animal species. (TN A&P 6)

### **Principles of Power and Energy**

- 21) Apply fundamental principles of physics as they relate to agricultural power and technology concepts in order to demonstrate the following:
- Analyze the relationship between speed, distance, and time

- b. Relate the types of simple machines to the law of machines and mechanical advantages
  - c. Specify groups, sources, and forms of energy
  - d. Analyze the principle of heat energy and describe the way heat travels
  - e. Explain the law of conservation of energy
  - f. Explain the production of energy and relate it to the invisible light spectrum
- (TN Math A-REI, A-APR; TN Physical Science 2)

### **Fundamentals of Electricity**

- 22) Identify different methods by which electrical energy can be produced. Discuss the safety hazards involved in each method as well as prevention and control methods relevant to electrical power supplies. Justify the use of different precautions for the prevention or management of electrical hazards and evaluate the efficacy of the prevention measures. (TN Writing 1, 4, 7, 9; TN Physical World Concepts 4; TN Physics 5)
- 23) Utilize the appropriate instruments needed to calculate and measure voltage, amperage, resistance, and wattage. (TN Reading 3; TN Math N-Q; TN Physical World Concepts 4; TN Physics 5)

### **Fundamentals of Engines**

- 24) Apply basic principles of thermodynamics to analyze the function of major components of gasoline and diesel fuel engines. (TN Physics 2)
- 25) Using quantitative reasoning and employing appropriate unit conversions, calculate horsepower and thermal efficiency in internal combustion engines by creating systems of equations that describe numerical relationships. (TN Math N-Q, A-CED)

## **Standards Alignment Notes**

\*References to other standards include:

- TN Reading: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 9-10 Students (page 62).
  - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 6, 8, and 10 at the conclusion of the course.
- TN Writing: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 9-10 Students (pages 64-66).
  - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3, 6, and 10 at the conclusion of the course.
- TN Math: [Tennessee State Standards for Mathematics](#); Math Standards for High School: Number and Quantity, Algebra, Statistics and Probability.
  - Note: The standards in this course are not meant to teach mathematical concepts. However, the concepts referenced above may provide teachers with opportunities to

collaborate with mathematics educators to design project based activities or collaborate on lesson planning. Students who are engaging in activities listed above should be able to demonstrate quantitative, algebraic, and statistical reasoning as applied to specific technical concepts. In addition students will have the opportunity to practice the habits of mind as described in the eight Standards for Mathematical Practice.

- SAE: [Supervised Agricultural Experience](#): All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- TN A&P: Tennessee Science: [Anatomy and Physiology](#) standards 1, 2, 4, 5, and 6 may provide additional insight and activities for educators.
- TN Biology I: Tennessee Science: [Biology I](#) standards 1, 2, 3, and 4 may provide additional insight and activities for educators.
- TN Biology II: Tennessee Science: [Biology II](#) standards 1, 2, 3, 4, and 7 may provide additional insight and activities for educators.
- TN Chemistry I: Tennessee Science: [Chemistry I](#) standard 1 may provide additional insight and activities for educators.
- TN Chemistry II: Tennessee Science: [Chemistry II](#) standards 1, 2, and 3 may provide additional insight and activities for educators.
- TN Environmental Science: Tennessee Science: [Environmental Science](#) standard 5 may provide additional insight and activities for educators.
- TN Physical Science: Tennessee Science: [Physical Science](#) standard 2 may provide additional insight and activities for educators.
- TN Physical World Concepts: Tennessee Science: [Physical World Concepts](#) standard 4 may provide additional insight and activities for educators.
- TN Physics: Tennessee Science: [Physics](#) standards 2 and 5 may provide additional insight and activities for educators.
- AFNR: [National Agriculture, Food and Natural Resources \(AFNR\) Career Cluster Content Standards](#): Students who are engaging in activities outlined above should be able to demonstrate fluency in Standards AS, CS, and PS at the conclusion of the course.
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
  - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.